

closely related. This implies that the host-specificity is physiological rather than ecological. This in turn raises a problem because Manter recorded his Fijian specimens from a *Plectropomus* sp. ("prob *maculatus*") whereas our examinations of 36 specimens of 3 species of *Plectropomus* at Heron Island have not revealed any specimens of *Mitotrema* although they are undoubtedly exposed to infection. Three possible explanations present themselves: 1) the Fijian and Queensland specimens are in fact different species, 2) the same species has different host-specificity at the 2 locations, and 3) Manter recorded the identity of the host wrongly. We see no particular evidence to support any of these explanations and believe that the matter must remain unresolved for the present.

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Research Note

Immature *Polyacanthorhynchus rhopalorhynchus* (Acanthocephala: Polyacanthorhynchidae) in Venton, *Hoplias malabaricus* (Pisces) from Moca Vie River, Bolivia, with Notes on its Apical Organ and Histopathology

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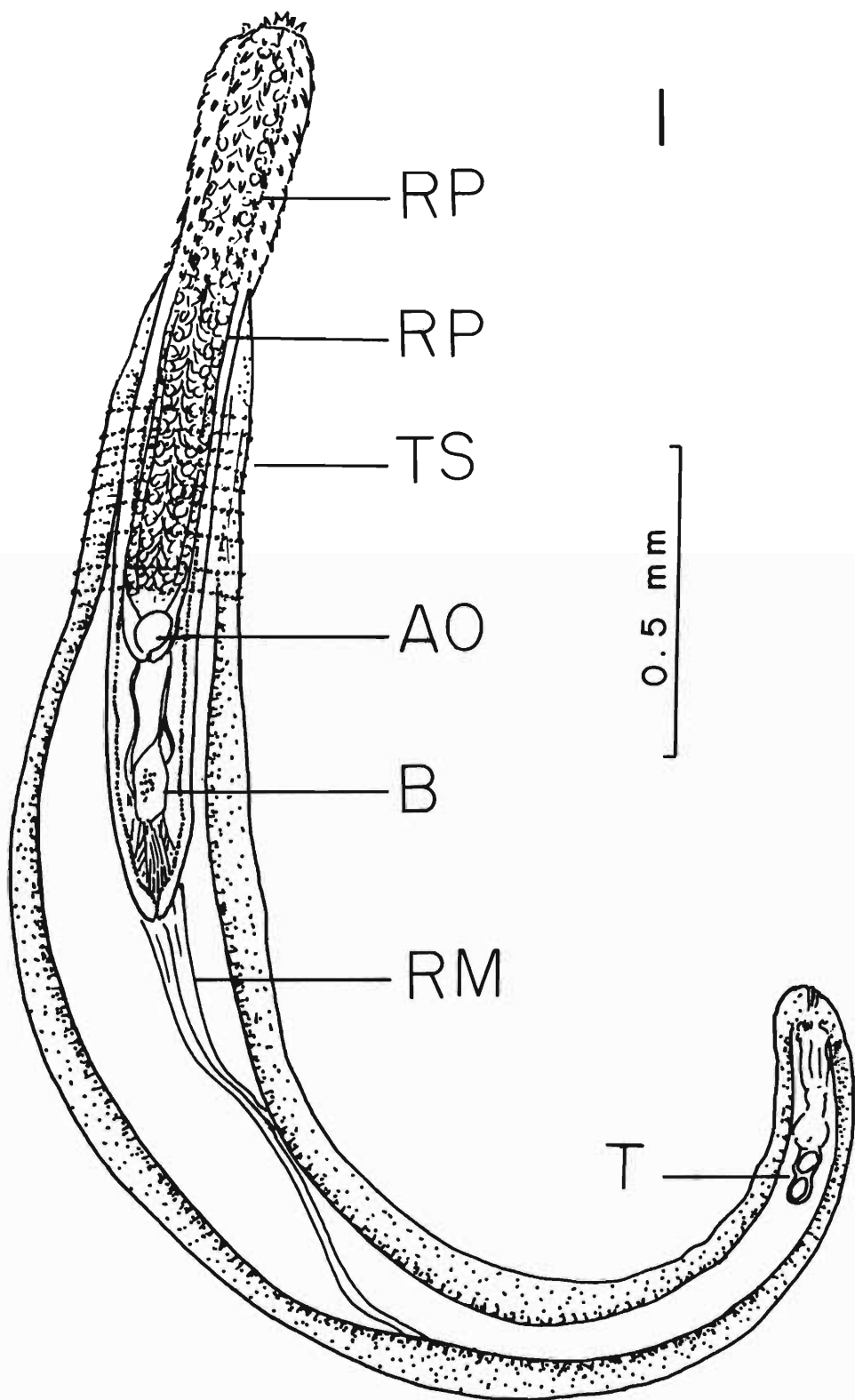
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ABSTRACT: Cystacanths of *Polyacanthorhynchus rhopalorhynchus* (Diesing, 1851) Travassos, 1920 were discovered in the viscera of venton, *Hoplias malabaricus* (Bloch, 1794) collected from the Moca Vie River at Las Palquitas, Bolivia. Apical proboscis organ and general morphological features were similar to but less developed than those of *Polyacanthorhynchus kenyanensis* Schmidt and Canaris, 1967 cystacanths from Africa. Cystacanths of *P. rhopalorhynchus* were not deeply embedded in liver tissue. A collagenous connective tissue capsule surrounded and attached the cystacanths to the liver surface. Necrosis of hepatocytes and subsequent inflammatory response were observed near encapsulated acanthocephalans. Cystacanths attached to the intestine were encapsulated in the fibroserosa.

KEY WORDS: *Polyacanthorhynchus rhopalorhynchus*, Acanthocephala, cystacanths, *Hoplias malabaricus*, paratenic host, apical organ, histopathology, Bolivia.

Amin (1987) recently erected a new order, Polyacanthorhynchida, and a new class, Polyacanthocephala, for the monogeneric family Polyacanthorhynchidae. Adults of 3 of the 4 known species of the genus *Polyacanthorhynchus* Travassos, 1920 infect South American caimans (Alligatoridae). These species are *Polyacanthorhynchus macrorhynchus* (Diesing, 1856) Travassos,



1920 (genotype); *Polyacanthorhynchus caballeri* Diaz-Ungria and Rodrigo, 1960; and *Polyacanthorhynchus rhopalorhynchus* (Diesing, 1856) Travassos, 1920. Immatures are unknown. The fourth species, *P. kenyensis*, is known only from the cystacanth stage infecting freshwater fishes in Kenya and was originally reported by Baylis (1928). Schmidt and Canaris (1967) later described it as *Polyacanthorhynchus kenyensis*. That description was expanded and amended by Amin and Dezfuli (1995).

The original brief description of *P. rhopalorhynchus* was amended by Machado Filho (1947), and revised by Diaz-Ungria and Rodrigo (1960). Machado Filho (1947) and Yamaguti (1963) reported adults from various species of caimans of the genera *Arapaima* and *Caiman* in Brazil. This is the first report of immatures of any of the South American species of *Polyacanthorhynchus* in a fish paratenic host.

Twenty-seven venton, *Hoplias malabaricus* (Bloch, 1794) (17 males, 10 females) were captured with hand-held seines from the Moca Vie River at Las Palguitas near Trinidad-Bolivia jungles (latitude 14.8°S, longitude 64.8°W) on 1–8 June 1993. Fish weighed 85–361 gm (mean 148) and measured 168–262 mm (192) in standard length. Liver surface and intestinal peritoneum of 13 fishes (50%) were parasitized by 28 *P. rhopalorhynchus* cystacanths (1–4 per infected fish). Thirteen worms (10 males, 3 females) were processed for microscopical study and the remaining specimens were sectioned in situ for histopathological observations using the methods of Amin and Heckmann (1991). All measurements (range followed by mean in parentheses) are in μm unless otherwise specified. The proboscis length was calculated from the length of the everted and the inverted portions; all proboscides were partially invaginated.

The partial retraction of the club-shaped proboscis did not obscure the presence of an apical organ at its inverted anterior tip (Fig. 1). The retraction, however, made it impossible to count or measure proboscis hooks, and caused the posterior displacement of the well-developed brain. The number of proboscis hook rows was 16–18 posteriorly. Hooks gradually decreased in size

posteriorly; all had simple roots that are relatively shorter than blades and directed posteriorly. Anterior cuticular trunk spines are in 8–10 circles with about 34–40 minute spines each. Lemnisci not pronounced. Reproductive system poorly developed in both sexes and occupies narrow posterior end of trunk; genital pores terminal.

Males ($N = 10$) (Fig. 1) 1.985–2.978 mm (2.552) long by 397–662 (480) wide; proboscis 1.430–1.690 mm (1.506) long by 169–208 (186) wide; proboscis receptacle 0.611–1.105 mm (0.848) long by 130–195 (184) wide; testes 26–39 (32) long by 26–40 (33) wide.

Females ($N = 2$) 2.445–2.813 mm (2.629) long by 430–496 (463) wide; proboscis 1.196–1.430 mm (1.313) long by 169–208 (188) wide; proboscis receptacle 780–845 (813) long by 156–195 (175) wide.

The general morphological features of the reported material were rather similar to but less developed than those of *P. kenyensis* cystacanths as reported by Amin and Dezfuli (1995). The size of the South American specimens is extremely small compared to the size of adult males and females (40–55 mm and 50–70 mm long, respectively, according to Machado Filho, 1947). Worms must undergo considerable growth once infected paratenic hosts are eaten by caimans.

Only cystacanths of *P. rhopalorhynchus* were found in the viscera of *H. malabaricus*. Host intestine was free from parasites. De Fabio (1982, 1983), however, reported nematode and acanthocephalan parasites, respectively, from the gut of the same host species near Campos, State of Rio de Janeiro, Brazil. The acanthocephalan parasites included *Quadrigyus machadoi* De Fabio, 1983 and *Neoechinorhynchus macronucleatus* Machado Filho, 1954 from the intestine, and undetermined “echinorhynchis” cystacanths from the body cavity. The latter specimens do not belong to *Polyacanthorhynchus* because they are flask-shaped with short proboscides, long necks, and anterior trunk spines that are not organized in regular circles.

An apical organ was noted at the anterior end of the inverted proboscis (Fig. 1) of all worms. A similar structure was described in cystacanths

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Figure 1. Male *Polyacanthorhynchus rhopalorhynchus* cystacanth from *Hoplias malabaricus* body cavity. Abbreviations: AO = apical organ, B = brain, RM = retractor muscles, RP = retracted portion of proboscis, T = testes; TS = circles of trunk spines.

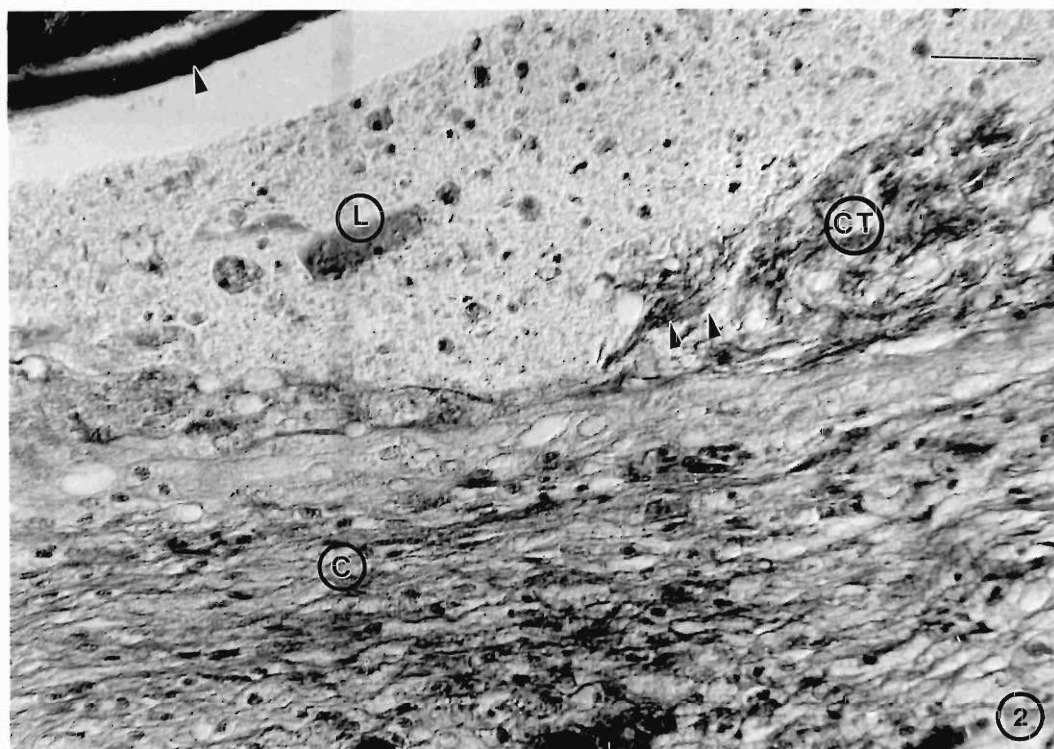


Figure 2. Cystacanth (arrow) invading host liver tissue (L). Necrosis of hepatocytes (double arrow) is evident with pycnotic nuclei invasion of connective tissue (CT). Capsule (C) of host liver is inflamed; many granulocytes and lymphocytes present. Measurement bar = 100 μ m.

Figure 3. Cystacanth (arrow) encapsulated on the surface of the fibroserosa of host intestine. Thin capsule (C) has formed around the immature acanthocephalan. Measurement bar = 100 μ m.

of *P. kenyensis* by Amin and Dezfuli (1995). However, no apical structures were observed in adults of any of the 3 South American species of the same genus. The original descriptions contained detailed illustrations of the proboscis. It is suggested that the apical structure in *P. rhopalorhynchus* cystacanths functions in secreting materials to aid in gut-wall penetration and invasion of body cavity tissues of the paratenic host. This is in agreement with the observations of Amin and Dezfuli (1995) on *P. kenyensis*.

The cystacanths appear to invade the surface of the liver, migrate under the connective tissue capsule, and cause necrosis of the surface hepatocytes (Fig. 2). There is an initial host tissue inflammatory response noted by granulocyte and lymphocyte aggregation at the site. Minimal hemorrhaging of damaged host tissue was observed. Pycnotic nuclei are observed with progression of cell necrosis (Fig. 2). Fibroblasts form a dense collagenous connective tissue capsule around the acanthocephalans. The capsule is infiltrated with lymphocytes and fat cells, and hypertrophy of connective tissue fibroblasts is also noted. The outer capsule surrounding the cystacanths represents an attempt by the host to isolate the organism from the organ (Fig. 2). The majority of the cystacanths were attached to the liver surface by a thin capsule. No acanthocephalans were "free" in the abdominal cavity of *H. malabaricus*. Those infecting the small intestine were attached to the surface of the fibroserosa with a thin layer of collagenous connective tissue surrounding the immature worms (Fig. 3).

SPECIMENS: Eight *P. rhopalorhynchus* cystacanths have been deposited in the University of Nebraska State Museum, Lincoln, Nebraska, Harold W. Manter Laboratory Coll. No. 38395.

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